ABSTRACT

A passive self energized, liquid device operates entirely on capillary action. A microfilter fractionates nanoliter volumes of suspension such as whole blood into suspended particles or cells and liquid fractions. Blood, for example, is fractionated with minimal cell lysis, and the filtrate (plasma) flux is dependent upon design parameters similar to factors controlling blood filtration in microporous membranes, i.e. active filter area, fluid velocity and microfilter geometry. Weir-style filters communicate with a blood flow channel to separate plasma from blood moving by capillary action. An expanded downstream channel with multiple parallel capillary blood flow path provides continuing movement of blood past the filters. Lysing is controlled by the size of the filter pores and the duration of adherence of the red blood cells to the pores. The controlled lysis or prevention of lysis of red blood cells is accomplished by manipulating the significant capillary forces generated in the filters. Filtration, cell lysis and microchannel blood flow models are integrated into an overall microfilter design useful for fabricating microfilter devices for lab-on-a-chip clinical applications where they can be coupled with on-chip electrical and electro-optical devices.